ASBESTOS-FREE JOINT COMPOUNDS

BACKGROUND OF THE INVENTION

In the construction of buildings, one of the most common elements is gypsum wallboard, often known as "drywall," used to construct the walls and/or ceilings. Walls made from gypsum wallboard are conventionally constructed by fixing the panels to studs, and filling and coating the joints with a specially prepared adhesive called a joint compound. This process generally proceeds in the following fashion: a taping grade joint compound is placed within the joint formed by the abutted edges of the wallboards, and a perforated tape is embedded within the taping compound. When dry (or set), a second, topping grade joint compound is coated over the joint. This may be sanded lightly, and a third coat is applied and conventionally finished. Another grade of joint compound is an all-purpose grade which may be used, as the name suggests, for embedding the tape and for the finishing coats. In some instances, a patterned effect is given to the all-purpose joint compound to leave a textured finish.

The primary difference in the past between the various grades of joint compound has been in the differences in the amounts of each ingredient. Thus, no matter what the grade, joint compounds invariably include a filler and a binder. More binder is used for the taping grade than for the topping grade. Typical fillers may be calcium carbonate, calcium sulfate hemihydrate, or calcium sulfate dihydrate. As is obvious, the choice determines whether the joint compound hardens by drying or by setting. An example of a setting type joint compound is taught in U.S. Pat. No. 3,297,601.

In addition, conventionally it has been necessary to include asbestos as a key ingredient. However, asbestos is becoming more and more an unacceptable health hazard, particularly where airborne. Health experts have indicated that not only does it cause mesothelioma, it may cause other forms of lung cancer as well, and may be a greater source for the latter than automobile fumes. Because of such effects, the Occupational Safety and Health Administration has established a U.S. Asbestos Standard, published in vol. 37, pp. 11320–11322 of the Federal Register, which provides that, at no time may the concentration of the asbestos fibers longer than 5 micrometers exceed 10 in number per cc. of air. In addition, effective July 1, 1976, the airborne concentration of asbestos longer than 5 micrometers in any working area, on the average, may not exceed two fibers per cc. of air. The asbestos in joint compounds becomes airborne in two ways: when the compound is dumped into water, and when the dried or set coat is sanded prior to the application of another coat or some other finish. Hand mixing the dry mix of ingredients into water is a primary first step, as many joint compounds are packaged dry and wetted by the applicator on site. The microscopic fineness of the asbestos causes it to literally puff into the air into an invisible cloud. Actual measurements have indicated that such mixing may cause a concentration of asbestos fibers longer than 5 micrometers of up to 55 fibers per cubic centimeter of air in the breathing area in the vicinity of the mixing period. Sanding may cause a fiber concentration of slightly over 3 fibers per cc. of air over an extended period of time. Clearly, by 1976, the conventional formula and the use of asbestos therein will hardly meet the above Asbestos Standard.

Thus, an asbestos-free joint compound is needed. Heretofore, such has not been readily obtainable, due to the unique combination of features provided by asbestos, especially concerning the workability of the joint compound.

SUMMARY OF THE INVENTION

The invention concerns the discovery that asbestos has provided certain functions in joint compounds which can be obtained from certain asbestos substitutes. More specifically, it has been found that an acceptable joint compound can be obtained, for use in finishing joints when mixed with water, from a mixture comprising a filler selected from the group consisting of calcium carbonate and calcium sulfate; a binder; and two of the following three ingredients: a water-holding agent, a slip-inducing colloid, and a non-swelling clay having sufficient pseudoplasticity to render the composition non-leveling. In most instances, all three of the above are used for best results.

Accordingly, it is an object of the invention to provide a joint compound having working properties heretofore achieved only through the use of asbestos, without the necessity of including asbestos in the formulation.

It is a related object of the invention to provide such a joint compound either in dry powder form or ready-mixed form, and either as a setting type or a drying type.

Other objects and advantages will become apparent upon reference to the following brief description of the drawings and the description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a log-log graph of shear rate versus both apparent and differential viscosity, measured for one of the ingredients utilized by the invention;

FIG. 2 is a graph illustrating shear rate versus apparent viscosity for another ingredient and,

FIG. 3 is a semi-log graph of viscosity versus RPM for yet another ingredient used in the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

It has been found that asbestos in joint compound provides three functions: non-leveling, slip, and water retention. The first two of these control the workability of the joint compound. By "non-leveling," it is meant the ability of the joint compound to retain at least temporarily a given shape against the influence of gravity. Other examples of this property include soft butter or a cake frosting. By "slip," it is meant the ability to spread smoothly in a frictionless manner, without drag.

It further has been found that two or all of three ingredients will provide the foregoing three functions, depending on the grade and type of joint compound desired. The best results are obtained when the ingredients are selected from 1) sodium carboxymethylcellulose, hereinafter SCMC, 2) attapulgus clay, and 3) a slip-inducing colloid such as amine-modified montmorillonite clay gel or xanthan gum. All three of these act as water-retention aids or water-holding agents, the SCMC having this as its primary function. The non-leveling function is provided primarily by the attapulgus clay. The slip is provided by both the attapulgus clay and the colloid. The relative amounts depend upon